FORM PTO-1390 (REV. 11-2000) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
0104-0330P	09/807916

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE99/01884	October 19, 1999	October 22, 1998

TITLE OF INVENTION

METHOD AND DEVICE FOR CONTROLLING A TURNING OPERATION

APPLICANT(S) FOR DO/EO/US

CLAESSON, Ingvar; LAGO, Thomas; HAKANSSON, Lars

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 00/25963
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is transmitted herewith.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98-International Search Report (PCT/ISA/210)
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
    1.) PCT Substitute Claims Letter w/ International Preliminary Examination Report (PCT/IPEA/409) and claims
    2.) Two (2) sheets of Formal Drawings

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/807916 NEW	PCT/SE99/01884	0104-0330P

21. ☒ The following fees are submitted:		CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):			
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1,000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$860.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =		**$ 1000.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		**$ 130.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	21 - 20 =	1	X **$18.00**	**$ 18.00**	
Independent Claims	4 - 3 =	1	X **$80.00**	**$ 80.00**	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		Yes	+ **$270.00**	**$ 270.00**	
			TOTAL OF ABOVE CALCULATIONS =	**$ 1498.00**	
☒ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				**$ -749.00**	
			SUBTOTAL =	**$ 749.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐20 ☐30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	**$ 0**	
			TOTAL NATIONAL FEE =	**$ 749.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property			+	**$ 0**	
			TOTAL FEES ENCLOSED =	**$ 749.00**	
				Amount to be: refunded	**$**
				charged	**$**

a. ☒ A check in the amount of $ 749.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account. No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2448.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:
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Date: April 20, 2001

By Joe McKinney Muncy #41,458
Joe McKinney Muncy, #32,334

/cqc

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	CLAESSON, Ingvar et al.	Conf.:	
Int'l. Appl. No.:	PCT/SE99/01884		
Appl. No.:	New	Group:	
Filed:	April 20, 2001	Examiner:	
For:	METHOD AND DEVICE FOR CONTROLLING A TURNING OPERATION		

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

April 20, 2001

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/SE99/01884 which has an International filing date of October 19, 1999, which designated the United States of America and was published in English.--

REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application. The claims have also been amended to delete improper multiple dependencies and to place the application into better form for examination. Entry of the present amendment and favorable action on the above-identified application are earnestly solicited.

Attached hereto is a marked-up copy of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By Matt L. Lane #41,458
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KM/cqc
0104-0330P

Attachment: Version With Markings Showing Changes Made

(Rev. 01/22/01)

VERSION WITH MARKINGS SHOWING CHANGES MADE

The specification has been amended to provide cross-referencing to the International Application.

The claims have been amended as follows:

7. (Amended) A turning tool holder as claimed in claim 4, [5 or 6,] characterized in that it comprises a vibration sensor (13, 15) which is embedded in the body of the turning tool holder (5).

METHOD AND DEVICE FOR CONTROLLING A TURNING OPERATION

Field of the Invention

The present invention relates to a method and a device for controlling a turning operation, more specifically a method, a device, a turning tool holder and a turning lathe for increasing the surface smoothness of a turned surface.

Background Art

When a workpiece is worked by means of a lathe, a certain degree of unevenness always arises in the turned surface. The unevenness can be resembled to stripes or threads and arises owing to the cutting edge of the working tool having a limited nose radius. The tools are manufactured with a plurality of different standard radii. The radius of the cutting edge results, in combination with the feeding, in a surface which is not quite smooth. A low feeding speed certainly gives a smoother surface but is irrational in industrial manufacture and therefore does not solve the problem.

For reasons of rationality and expense, much would be gained if, in spite of a relatively high feeding speed, it would be possible to obtain a surface having such a high smoothness that the finishing which today is often necessary can be eliminated or, in any case, be significantly reduced.

Summary of the Invention

An object of the present invention is to provide a method and a device for increasing the surface smoothness in turning.

The object is achieved by a device and a method according to claims 1 and 12, respectively.

Brief Description of the Drawings

The invention and further advantages thereof will now be described in more detail by way of embodiments with reference to the accompanying drawings, in which

Fig. 1 is a schematic perspective view of an embodiment of the inventive device;

Fig. 2 is a schematic view of an embodiment of a tool holder according to the invention; and

Fig. 3 is a schematic plan view of the device in Fig. 1.

Description of an Embodiment

Fig. 1 illustrates essentially an embodiment of the device and also of the tool holder according to the invention. Reference numeral 1 indicates a workpiece which is arranged in a lathe and rotates in the direction indicated by arrow P1. The workpiece 1 is worked by means of a tool 3, here referred to as insert, which is rigidly connected to a tool holder 5, here referred to as insert holder. The device comprises a control system with a control unit 7 and two actuators 9, 11, one of which is indicated by dashed lines in Fig. 1 and both of which are shown in Fig. 2, which illustrates the actual tool holder 5 in a different view.

Each actuator 9, 11 comprises an active element 9, 11, which here is a piezoceramic element. A piezoceramic element can in turn be designed as a unit or advantageously be made up as a so-called stack and/or of several partial elements. Thus the element can be a solid body or a plurality of individual, but composed and interacting bodies. The active elements 9, 11 are embedded in the body of the tool holder 5, which is also referred to as shaft. More specifically, they are fixed by casting. The casting is carried out by forming for each active element 9, 11 a recess in the body of the tool holder, whereupon the active element 9, 11 is placed therein and covered by casting. The active element 25, 27 is glued preferably to the bottom surface of the recess. The active elements 9, 11 are embedded fairly close to the surface of the tool holder 5, i.e. close to its lateral surfaces 5d, 5e. Moreover, the active elements 9, 11 are plate-shaped and are oppositely arranged in parallel.

The active elements 9, 11 are arranged on each side of the centre axis of the tool holder 5, said centre axis being designated I-I in Fig. 2. An active element 9, 11 is characterised in that it changes dimension when an electric voltage is applied across the same. The dimensional change is related to the voltage. Moreover, the tool 3 is mounted on the upper side 5c of the holder 5.

The control unit 7 is via a conduit 15 and a terminal 17 connected to the tool holder 5. Inside, i.e. embedded in, the tool holder 5 extend to/from the terminal 17 conductors 30-33 of the active elements, or the piezoceramic elements 9, 11, see Fig. 3. The piezoceramic elements 9, 11 are elongate in the longitudinal direction of the tool holder 5, and the conductors 30-33, which are connected in pairs to a piezoceramic element 9, 11 each, are connected to the front ends 11a, 9a and rear ends 11b, 9b thereof.

The device operates as follows. The tool 3 and the tool holder 5 are fed in the direction of arrow P2 at a certain feeding speed M. The workpiece rotates in the direction of arrow P1 at a certain cutting speed. The combination of M>O, and the edge of the tool 3 having a radius causes remaining, helically extending ridges on the worked surface. More than anything, the ridges resemble stripes. The control unit 7 feeds control voltages to the actuators, more specifically to the piezoceramic elements 9, 11. When voltage is applied to the piezoceramic elements 9, 11, they are thus extended to a greater or smaller degree depending on the amplitudes of the voltages. In other words, each piezoceramic element 9, 11 obtains a dimensional change in its longitudinal direction, which also is the longitudinal direction of the tool holder 5. The piezoceramic elements 9, 11 are preferably embedded in the tool holder 5 so that their boundary surfaces abut directly against the material of the body of the tool holder 5. The piezoceramic elements 9, 11 have opposite power-transmitting surfaces in the

form of their end faces at the ends 9a, 9b, 11a and 11b. The end faces transfer the longitudinal changes of the piezoceramic elements 9, 11 in the body of the tool holder 5. Since the piezoceramic elements 9, 11 are spaced from the centre axis I-I of the tool holder 5, the longitudinal changes generate turning moments which in the illustrated arrangement of the piezoceramic elements 9, 11 show themselves as bending. By the expression "spaced from the centre axis" is meant that the centre axes of the piezoceramic elements 9, 11 do not coincide with the centre axis of the tool holder 5. If the centre axes should coincide, no bending moment would be obtained, but merely a pure longitudinal change of the tool holder 5. The same would apply if the two piezoceramic elements 9, 11 should be longitudinally changed concurrently and to the same extent. The forces induced by means of the piezoceramic elements 9, 11 bend the front end 5a of the tool holder 5 in the lateral direction, from side to side, thanks to the control voltages to the respective piezoceramic elements 9, 11 being applied so that the piezoceramic elements 9, 11 are longitudinally changed in opposition to each other. Thus the tool holder 5 is made to move in a vibrating manner alternatingly in and against the direction of feed.

The turning moments thus act about an axis which is perpendicular to the centre axis I-I and produce a vibrating motion in the lateral direction, as indicated by arrow P3. By the lateral vibrations, the groove which the tool forms in the surface of the workpiece 1 is widened and the stripes are worked off. The appearance of the control voltages, however, is important to the result. In a preferred embodiment of the device, the control unit 7 generates composite control voltages having a wide, noise-like frequency content. A factor in this context, however, is the feeding speed M which may vary quite considerably between different turning operations. The feeding speed is above all important to the amplitude

of the control voltages. A preferred embodiment of the inventive device therefore comprises a control unit which is adjustable in respect of the amplitude of the control voltages. As a result, different amplitudes can be generated.

Alternative Embodiments

The above specification essentially constitutes a non-limiting example of how the device according to the invention can be designed. Many modifications are possible within the scope of the invention as defined in the appended claims. Below follow some examples of such modifications.

In an alternative embodiment, the control unit also comprises a means for adjusting the frequency content of the control voltages.

In a further alternative embodiment, the control unit has preset values of frequency and amplitude of the control voltages.

In one more alternative embodiment of the inventive device, the control unit 7 operates with fed-back control, which means that it strives to set the amplitude of the vibrations at a suitable level by means of feed-back from sensors. The control unit 7 can be selected among many different types, such as analog fed-back control unit, conventional PID regulator, adaptive regulator or some other suitable type of control unit. To achieve said fed-back control, the sensors 13, 15 are arranged in the tool holder 5 as illustrated in the Figures. The sensors 13, 15 are arranged in front of the actuators 9, 11. By "in front of" is meant closer to the end of the tool holder 5 where the tool 3 is mounted, said end being naturally considered the front end 5a of the tool holder 5. The opposite end 5b thus is the rear end of the tool holder 5. The sensors 13, 15 consist of piezoelectric crystals which generate an electric voltage when subjected to forces. The sensors 13, 15 are preferably, like the actuators 9, 11, embedded in the body of the tool holder

5 and are electrically connected with the control unit 7 via conductors which are connected in the same way as the conductors 30-33 of the actuators, but which for reasons of clarity are not shown.

The sensors 13, 15 are subjected to alternating pulling and pressing forces. Each sensor 13, 15 then generates a sensor voltage which varies concurrently with the variations in force. The sensor voltages are detected and analysed by the control unit 7, which controls the actuators 9, 11 in accordance with the desired amplitude of the sensor voltages. The regulation which this involves is carried out by means of a control algorithm. A large number of known control algorithms are available.

In one more alternative embodiment of the device according to the invention, the control unit takes the present feeding speed into consideration, i.e. the control unit has a means for indicating which feeding speed is appropriate for the turning operation which is to begin. In an NC-controlled lathe, the means can even automatically collect this information directly from the NC control system.

A further possible modification is to change the number of actuators. In the simplest case, one actuator is arranged in the tool holder. To achieve a more symmetric application of forces on the tool holder, it is however advantageous to arrange at least the above-described pair of actuators in the described opposite arrangement. There is nothing to prevent that a larger number of actuators are arranged which are oppositely arranged in pairs in the tool holder. For practical reasons and in view of the production costs, it is however disadvantageous to embed a large number of actuators.

The method of mounting the active elements may be varied. In addition to the above-mentioned way of mounting, they can be, for example, premounted in a mould in which the tool holder is cast. If they are fixed by cast-

ing later, as has been described above, they can either be covered with the same material as that of which the tool holder is made or with some other convenient material. Moreover it is possible to use alternatives to the above-described, preferred mounting, where the elements are certainly glued to the base of the recess but two opposite power-transmitting surfaces essentially generate the turning moments. Such an alternative means that the dimensional change is completely transferred via the glue joint, which in principle is possible with today's strongest adhesives. In that case, the abutment of the above-mentioned power-transmitting surfaces can be omitted, which reduces the claims for adaptation. Also other variants are contained within the scope of the invention.

The active elements are in respect of form not bound to be rectangularly parallelepipedal and plate-shaped as the shown elements, but the form may vary. The plate shape, however, is advantageous since it contributes to minimising the volume of the element. Moreover, an elongate form is an excellent property which also contributes to imparting to the element a small volume. It is preferred that the dimensional changes occur in the longitudinal direction of the element.

Basically, other types of actuators and ways of mounting than those described above are contained within the scope of the invention. However, embedded, active elements have obvious advantages.

CLAIMS

1. A device for increasing the surface smoothness of a turned surface, said device comprising a control system comprising a control unit (7) and an actuator (9, 11) connectible to the control unit and connectible with a tool holder (5), characterised in that said actuator is adapted to impart a vibrating motion in the lateral direction to the tool holder, wherein the tool holder is made to move in a vibrating manner alternatingly in and against the direction of feed when the device is mounted in a turning lathe.

2. A device as claimed in claim 1, characterised in that said actuator (9, 11) comprises an active element (9, 11) which is embeddable in the body of the tool holder (5).

3. A device as claimed in claim 1 or 2, characterised in that the control system comprises a vibration sensor (13, 15) connectible to the control unit (7) and connectible with the tool holder (5), that said vibration sensor is adapted to detect vibrations of the tool holder in the lateral direction, and that the control unit is adapted to control the vibrating motion by controlling the actuator according to sensor signals from the vibration sensor.

4. A turning tool holder, characterised in that it comprises an actuator (9, 11) which is adapted to impart a vibrating motion in the lateral direction to the turning tool holder (5), wherein the turning tool holder is made to move in a vibrating manner alternatingly in and against the direction of feed when the device is mounted in a turning lathe.

5. A turning tool holder as claimed in claim 4, characterised in that said actuator (9, 11) comprises an active element (9, 11) which is embedded in the body of the turning tool holder (5).

6. A turning tool holder as claimed in claim 4 or 5, c h a r a c t e r i s e d in that it comprises at least one pair of active elements, the active elements included in the pair being oppositely arranged on each side of the centre axis of the turning tool holder (5).

7. A turning tool holder as claimed in claim 4, 5 or 6, c h a r a c t e r i s e d in that it comprises a vibration sensor (13, 15) which is embedded in the body of the turning tool holder (5).

8. A turning lathe comprising a tool holder (5) and an actuator (9, 11) connected with the tool holder, c h a r a c t e r i s e d in that the actuator is adapted to impart a vibrating motion in the lateral direction to the tool holder, in order to make the tool holder move in a vibrating manner alternatingly in and against the direction of feed.

9. A turning lathe as claimed in claim 8, c h a r - a c t e r i s e d in that it comprises a control system, the control system comprising a control unit (7) and a vibration sensor (13, 15) connected to the control unit and connected with the tool holder, that said actuator is connected to the control unit, that said vibration sensor is adapted to detect the vibrations of the tool in the lateral direction, and that the control unit is adapted to control the vibrating motion by controlling the actuator according to sensor signals from the vibration sensor.

10. A turning lathe as claimed in claim 8 or 9, c h a r a c t e r i s e d in that said actuator (9, 11) comprises an active element (9, 11) which is embedded in the body of the tool holder (5).

11. A turning lathe as claimed in claim 10, c h a r a c t e r i s e d in that said active element (9, 11) is a piezoceramic element (9, 11).

12. A method for increasing the surface smoothness of a turned surface, comprising the step of controlling the vibrations of a tool holder during turning,

characterised by the step of imparting a vibrating motion in the lateral direction to the tool holder, in order to make the tool holder move in a vibrating manner alternatingly in and against the direction of feed.

13. A method as claimed in claim 12, characterised by the step of imparting to the tool holder said vibrating motion by means of an actuator comprising an active element embedded in the body of the tool holder.

14. A method as claimed in claim 13, characterised by the step of controlling in a fed-back manner said vibrating motion by detecting the lateral vibration of the tool holder and controlling said actuator according to said lateral vibration.

15. A method as claimed in any one of claims 12-14, characterised by the step of adjusting said vibrating motion to the feeding speed.

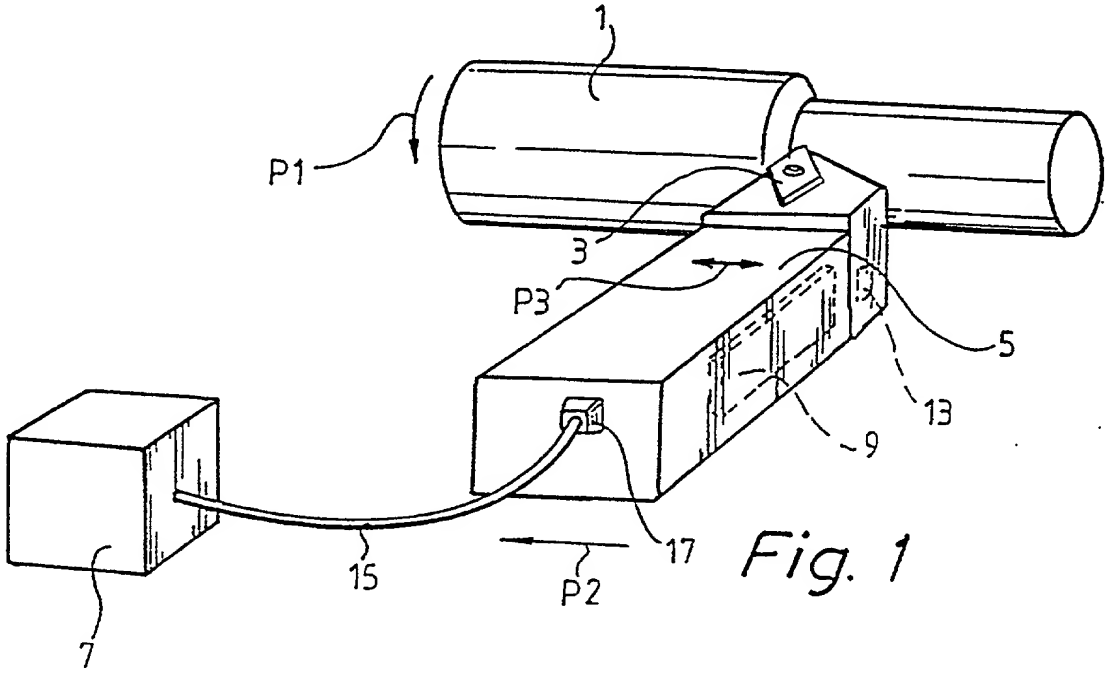

Fig. 1

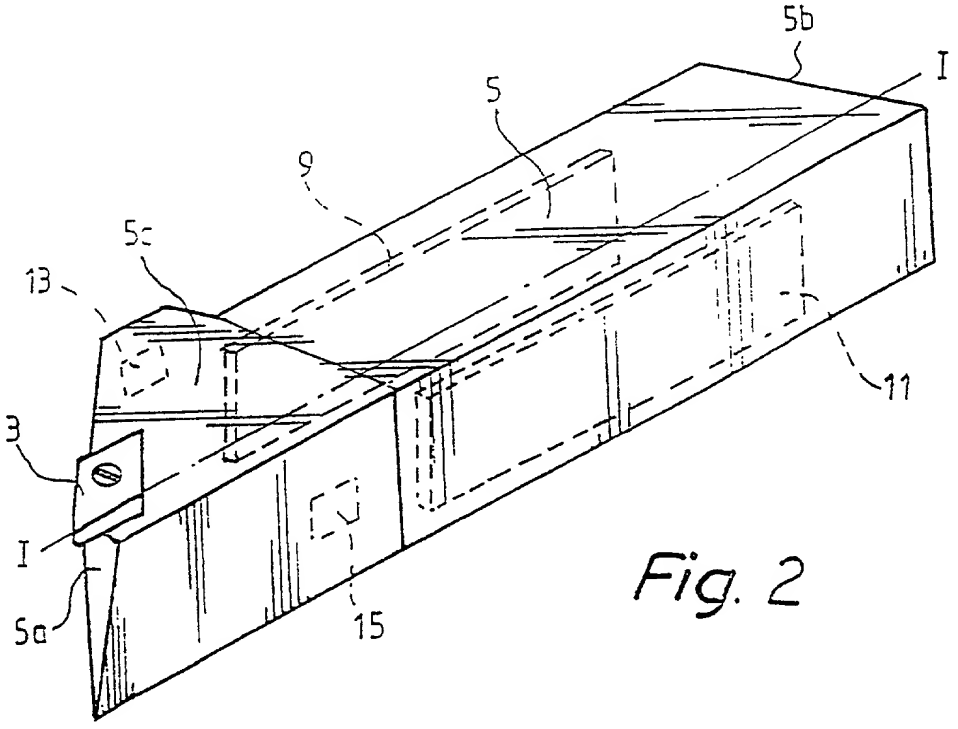

Fig. 2

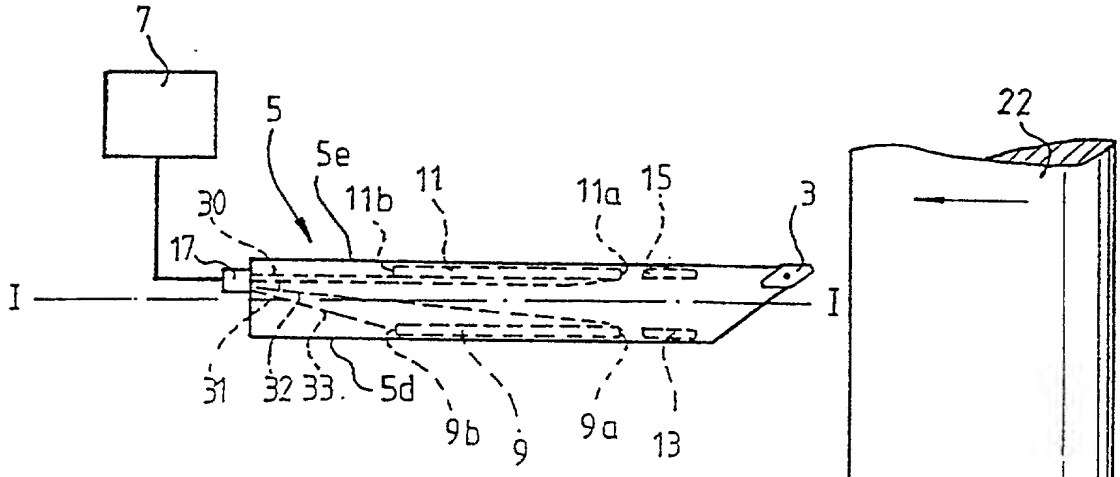

Fig. 3

Attorney Docket No. 0104-0330P

#3

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PLEASE NOTE: YOU MUST COMPLETE THE FOLLOWING

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title: METHOD AND DEVICE FOR CONTROLLING A TURNING OPERATION

Fill in Appropriate Information - For Use Without Specification Attached:

the specification of which is attached hereto. If not attached hereto,
the specification was filed on April 20, 2001 as
United States Application Number 09/807,916;
and amended on April 20, 2001 (if applicable) and/or
the specification was filed on October 19, 1999 as PCT
International Application Number PCT/SE99/01884; and was
amended under PCT Article 19 on November 22, 2000 (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Insert Priority Information: (if appropriate)

Prior Foreign Application(s)			Priority Claimed	
9803606-4 (Number)	Sweden (Country)	October 22, 1998 (Month/Day/Year Filed)	☒ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No
(Number)	(Country)	(Month/Day/Year Filed)	☐ Yes	☐ No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below.

Insert Provisional Application(s): (if any)

(Application Number) (Filing Date)

(Application Number) (Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Insert Requested Information: (if appropriate)

Country	Application Number	Date of Filing (Month/Day/Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Insert Prior U.S. Application(s): (if any)

(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

19

Raymond C. Stewart	(Reg. No. 21,066)	Terrell C. Birch	(Reg. No. 19,382)
Joseph A. Kolasch	(Reg. No. 22,463)	James M. Slattery	(Reg. No. 28,380)
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Full Name of First or Sole Inventor: Insert Name of Inventor → Insert Date This Document is Signed

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Full Name of Second Inventor, if any: see above

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Full Name of Third Inventor, if any: see above

Full Name of Fourth Inventor, if any: see above

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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